APPENDIX E
(Updated)

M E M O R A N D U M

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From: Ian Crooks and Chris Cook, P.E., CAW

Date: December 14, 2015

Subject: Monterey Peninsula Water Supply Project (MPWSP)

Capital and O&M Cost Estimate Update

OBJECTIVE

The objective of this technical memorandum (TM) is to update the Monterey Peninsula Water Supply Project's (MPWSP, or Project) capital and operation and maintenance (O&M) estimated costs with additional information received since the previous TM prepared by RBF Consulting (RBF) dated January 9, 2013.

BACKGROUND

For background on capital and O&M cost estimating work completed prior to 2013, refer to the background section of the TM by RBF from January 9, 2013. Since the RBF report, a design build (DB) contract has been signed for the desalination plant that is currently at 60% construction documents (CD). California American Water (CAW) has also received proposals from contractors for construction of the source water slant wells and conveyance facilities which include the "CAW-Only Facilities".

PROJECT FACILITIES

The northern facilities capital cost estimates in this memorandum are based on Table 1 below. For the previous facilities description, refer to Table 2 of RBF's TM dated January 9, 2013.

Table 1
Summary Description of Northern Facilities

Facility	6.4 MGD Desalination Option	9.6 MGD Desalination Option
INTAKE WELLS & SUPPLY/RETURN FACILITIES		
Slant Test Well	790 LF, 19-Deg, 10-Inch, Diam., 2,000 gpm	
Slant Intake Wells and Pipelines	Seven 10-in. wells, 1000 LF, 14-deg,2000 gpm	Nine 10-in. wells, 1000 LF, 14-deg, 2000 gpm
Submersible Pump and Motor	Eight 2,000 gpm, 300 hp	Ten 2,000 gpm, 300 hp
Intake Electrical and I&C	RTUs, VFDs, Cable, MCCs	
Feedwater Pipeline	15,500 LF of 42-inch. diamond 30-inch HDPE	
Brine Return & SVR Pipelines	5,000 LF of 24-inch diam. & 6,200 LF of 12-inch	
Connection to Outfall	Metering Structure & outfall connection	
DESALINATION PLANT		
Granular Media Filters	7 pressure filters, 12 ft dia. x 48 ft long	10 pressure filters, 12 ft dia. X 48 ft long
Filtered Water Tanks	2 tanks x 0.3 MG circular, lined steel, above-ground	
Filtered Water Pumps	2 pumps x 7.9 MGD w/VFDs; 2 pumps x 4.0 MGD w/VFDs	2 pumps x 11.9 MGD w/VFDs; 2 pumps x 5.9 MGD w/VFDs
Cartridge Filters	5 filters	7 filters
Filter Backwash System	2 pumps x 15.6 MGD, constant speed	
Reverse Osmosis System	1st Pass + 40% to 2nd Pass 5 modules x 1.6 MGD w/VFDs; energy recovery on 1st Pass	1st Pass + 40% to 2nd Pass 7 modules x 1.6 MGD w/VFDs; energy recovery on 1st Pass
Post Treatment System	UV Disinfection, CO2, Ca(OH)2, NaOCl, NaOH, ZnPO4	UV Disinfection, CO2, Ca(OH)2, NaOCl, NaOH, ZnPO4
Chemical Storage and Feed	NaOCl (onsite generation), NaHSO3, CO2, Ca(OH)2, NaOH, ZnPO4, H2SO4, Membrane Antiscalant, Membrane Cleaning Solutions	
Filter Backwash Reclamation System	2 reclamation basins x 0.34 MG open, lined with decant; 3 reclamation pumps x 0. 5 MGD w/ VFDs	
Brine Storage and Disposal	1 equalization basin x 3 MG open, lined; 2 pumps x 6 MGD w/VFDs; dechlorination system; aeration system	
Treated Water Tanks	2 tanks x 0.75 MG circular, concrete, baffled, above-ground	
Treated Water Pump Station	2 pumps x 3.2 MG w/ VFDs; 2 pumps x 1.6 MGD w/ VFDs	2 pumps x 4.8 MGD w/ VFDs; 2 pumps x 2.4 MGD w/VFDs
Salinas Valley Pump Station	2 pumps x 1.2 MG w/ VFDs;	2 pumps x 1.2 MG w/ VFDs;
Emergency Power (for DWPS)	500 kW diesel generator	750 kW diesel generator
Admin/O&M/Lab Building	6,000 SF, single story, 18 ft high	
Filter Building	3,500 SF, single story, 24 ft high	4,000 SF, single story, 24 ft high
RO and Chemical Building	30,000 SF, single story, 30 ft high 19,200 SF, 26 Ft High	
DESALINATED WATER CONVEYANCE PIPELINE (TO CAW)		
Transfer Pipeline (desal to Seaside border)	34,000 LF of 36-inch diam.	

The project facilities south of where the Transfer Pipeline meets the Seaside border, described as the "CAW-Only Facilities", are summarized in table 2 below.

Table 2
Summary Description of Southern "CAW-Only Facilities"

Facility	6.4 MGD Desalination Option	9.6 MGD Desalination Option
CAW Conveyance System		
Transfer Pipeline (Seaside Border to Terminal Reservoir)	14,000 LF of 36-inch diam.	
Monterey Pipeline	35,000 LF of 36-inch diam.	
Monterey Pump Station	2 x 50 HP & 1 x 100 HP	
Valley Greens Pump Station	3 x 50 HP	
Terminal Reservoir		
Reservoir Structure	2 x 3 MG	
ASR System		
Wells 5 & 6	2 wells	
ASR Pipeline	13,000 LF of 16-inch diam.	

CAPITAL COST ESTIMATING METHODOLOGY AND GENERAL NOTES

Capital costs include construction costs, Land and ROW acquisition, and allowances for implementation, escalation, mitigation and contingencies. These cost estimates are built on the previous work done in RBF's January 9, 2013 technical memoranda, using similar costing spreadsheets. Base construction costs were updated with costs indicated in the desalination plant DB contract and proposals received for both the construction of source water slant wells and conveyance facilities. Additional development of the overall project design resulted in updating of configurations, process design, quantities and materials.

The following are additional cost conditions used for estimating allowances:

- **Implementation** costs were totaled to date and then a forecast estimate was added for the additional years to complete the project. The desalination plant engineering and mobilization costs were subtracted from the implementation costs to date, since they are included in the base construction DB contract. Most, if not all, of the design effort for a 9.6 MGD desalination project will be expended even if the smaller project is constructed. For this reason, the implementation costs were estimated to be the same for both the 9.6 MGD and 6.4 MGD desalination options.
- **Escalation Allowance** was added with 12.25% for the desalination plant and 4% for all other project components, except the ASR System.
- **Contingencies** were broken down between known and estimated costs with ten percent contingency for the sum of known base construction cost and twenty-five percent contingency for the sum of estimated base construction cost.
- **Mitigation** costs were reduced to zero percent since the mitigation risk has been transferred to the contractor via the plans and specification in which the contractors bid. For new mitigation items that may appear in the next version of the Draft EIR, the remaining Contingency budget will be used to cover those costs.

SUMMARY OF UPDATED CAPITAL COST ESTIMATES

The updated capital cost estimates for the 6.4 MGD and 9.6 MGD project options are summarized below and are compared with the estimated costs at the time of the Settlement. The 2012 Dollar total capital cost did not take into account the escalation allowance, which is simply indicated as "NA".

Table 3
Summary Capital Cost Estimate (2015 vs 2012 Dollars)

Item	Dec. 2015 Update (2015 Dollars)		Nov. 2013 Update (2012 Dollars)	
	6.4 MGD	9.6 MGD	6.4 MGD	9.6 MGD
Base Construction Costs				
Intake Wells/Supply/Return Facilities	$51 M	$ 58 M	$ 39 M	$ 47 M
Desalination Plant	$ 80 M	$ 87 M	$ 65 M	$ 84 M
Northern Transfer Pipeline	$14 M	$ 14 M	$ 11 M	$ 11 M
CAW Convey., Term. Reser., & ASR Systems	$ 71 M	$ 71 M	$ 53 M	$ 53 M
Base Construction Subtotal	$ 216 M	$ 229 M[1]	$ 168 M	$ 195 M
Implementation Costs	$ 52 M	$ 52 M	$ 43 M	$ 43 M
ROW/Land/Outfall	$ 15 M	$ 15 M	$ 8 M	$ 9 M
Escalation Allowance	$ 13 M	$ 15 M	NA	NA
Contingency Allowance	$ 26 M	$ 28 M	$ 42 M	$ 57 M
Mitigation Cost Allowance	NA	NA	$ 3 M	$ 3 M
Brine & Potrero Rd	see Note[2]	see Note[2]	$ 32 M	$ 32 M
Total Capital Cost	$ 322 M	$ 338 M[1]	$ 296 M	$ 338 M[1]

A further comparison breakdown of the individual base construction components are described in the following capital cost sections.

Intake Wells and Supply/Return Facilities

This category of facilities includes the facilities required to obtain and deliver raw water (feedwater) to the desalination plant, to convey intermittent pump-to-waste raw water from the intake wells to the MRWPCA outfall, to convey reverse osmosis RO concentrate (brine) from the desalination plant to the MRWPCA outfall, and to convey desalinated water from the desalination plant to the CSIP irrigation water storage basin. The expected one-time fee for connection to the MRWPCA outfall along with potential outfall improvements, have been added since the Settlement. The cost breakdown summary is indicated below in Table 4:

[1] The total does not equal the sum of the above line items due to rounding.

[2] A brine outfall modification cost has been included in the intake/discharge portion of the estimate. No further cost has been allocated for the Potrero Road pipeline due to the promising test well results. However, the budget amount is still needed to cover the increases in pipeline costs on the project.

Table 4
Intake Wells and Supply/Return Facilities Cost Estimate (2015 vs 2012 Dollars)

Item	Dec. 2015 Update (2015 Dollars)		Nov. 2013 Update (2012 Dollars)	
	6.4 MGD	9.6 MGD	6.4 MGD	9.6 MGD
Base Construction Costs				
Slant Test Well	$ 5.7 M	$ 5.7 M	$ 5.0 M	$ 5.0 M
Slant Intake Wells	$ 19.8 M	$ 25.1 M	$ 16.2 M	$21.6 M
Intake Pump Station	NA	NA	$ 2.9 M	$ 4.2 M
Well Mech. Vault & Assembly	$ 0.4 M	$ 0.5 M	NA	NA
Submersible Pump and Motor	$ 2.0 M	$ 2.5 M	NA	NA
Intake Electrical and I&C	$ 1.6 M	$ 2.0 M	NA	NA
Beach Facilities	NA	NA	$ 5.4 M	$ 6.1 M
Tunnel Under Dunes	NA	NA	$ 5.0 M	$ 5.0 M
Comparison Subtotal	$ 29.5 M	$ 35.8 M	$ 34.5 M	$ 41.9 M
Feedwater Pipeline	$ 10.6 M	$ 10.6 M	$ 2.7 M	$ 3.1 M
Brine, SVR Pipeline, & Outfall Connection	$ 4.2 M	$ 4.2 M	$ 1.9 M	$ 1.9 M
Outfall Improvements	$ 7.0 M	$ 7.0 M	NA	NA
Base Construction Subtotal	$ 51.3 M	$ 57.6 M	$ 39.1 M	$ 46.9 M
Implementation Costs	$ 13.7 M	$ 13.7 M	$ 9.4 M	$ 9.4 M
ROW/Land/Outfall	$ 5.1 M	$ 5.1 M	$ 2.9 M	$ 3.7 M
Escalation Allowance	$ 2.0 M	$ 2.2 M	NA	NA
Contingency Allowance	$ 7.1 M	$ 7.9 M	$ 10.0 M	$ 15.0 M
Mitigation Cost Allowance	NA	NA	$ 0.7 M	$ 0.7 M
Total Capital Cost	$ 79.2 M	$ 86.5 M	$ 62.1 M	$ 75.7 M

The items indicated as 'NA' are based on design updates or changes in governmental agency requirements.

Desalination Plant

This category of facilities includes the facilities required to receive, filter, and desalinate the feedwater pumped from the intake wells; condition and disinfect the desalinated water; process and/or recycle residual streams from the process; store and pump desalinated water; and house equipment and personnel.

Table 5
Desalination Plant Cost Estimate (2015 vs 2012 Dollars)

Item	Dec. 2015 Update (2015 Dollars)		Nov. 2013 Update (2012 Dollars)	
	6.4 MGD	9.6 MGD	6.4 MGD	9.6 MGD
Base Construction Costs				
Plant Inlet and Pretreatment	Included in DB	Included in DB	$ 5.4 M	$ 7.2 M
Reverse Osmosis System	Included in DB	Included in DB	$ 21.0 M	$ 29.3 M
Post Treatment System	Included in DB	Included in DB	$ 1.1 M	$ 1.3 M
Residuals Handling and Treatment	Included in DB	Included in DB	$ 1.1 M	$ 1.1 M
Clearwell PS, Clearwells and DWPS	Included in DB	Included in DB	$ 4.9 M	$ 6.2 M
Plant Infrastructure	Included in DB	Included in DB	$ 21.6 M	$ 26.4 M
Engineering, Mobilization/Demob.	$ 11.0 M	$ 11.2 M	$ 9.4 M	$ 12.1 M
Base Construction Subtotal	$ 79.8 M	$ 87.0 M	$ 64.5 M	$ 83.6 M
Implementation Costs	$ 18.0 M	$ 18.0 M	$ 16.7 M	$ 16.7 M
ROW/Land	$ 0.6 M	$ 0.6 M	$ 0.6 M	$ 0.6 M
Escalation Allowance	$ 8.4 M	$ 9.3 M	NA	NA
Contingency Allowance	$ 8.0 M	$ 8.7 M	$ 16.0 M	$ 25.2 M
Mitigation Cost Allowance	NA	NA	$ 1.0 M	$ 1.0 M
Total Capital Cost	$ 114.8 M	$ 123.6 M	$ 98.8 M	$ 127.1 M

The Updated Project Cost estimate has several cells indicating 'included in DB'. This is because CAW has a DB contract for the desalination plant, so the Base Construction Subtotal is fixed and not dependent on the breakdown of subcomponents.

The 2015 Dollar escalation allowance is based off of 3.5% over 3.5 years (12.25% total). This escalation allowance is multiplied by the difference of the Base Construction Subtotal and the Engineering, Mobilization/Demobilization cost.

Northern Transfer Pipeline

Table 6 shows the transfer pipeline from the Desalination Plant to the border of Seaside.

Table 6
Northern Transfer Pipeline Cost Estimate (2015 vs 2012 Dollars)

Item	Dec. 2015 Update (2015 Dollars)		Nov. 2013 Update (2012 Dollars)	
	6.4 MGD	9.6 MGD	6.4 MGD	9.6 MGD
Base Construction Costs	$ 13.9 M	$ 13.9 M	$ 10.9 M	$ 10.9 M
Implementation Costs	$ 3.3 M	$ 3.3 M	$ 2.2 M	$ 2.2 M
ROW/Land	$ 6.1 M	$ 6.1M	$ 1.5 M	$ 1.5 M
Escalation Allowance	$ 0.5 M	$ 0.5 M	NA	NA
Contingency Allowance	$ 1.4 M	$ 1.4 M	$ 3.7 M	$ 3.7 M
Mitigation Cost Allowance	NA	NA	$ 0.2 M	$ 0.2 M
Total Capital Cost	$ 25.2 M	$ 25.2 M	$ 18.5 M	$ 18.5 M

Facilities in CAW Service Area

Table 7 shows the Facilities in the CAW Service Area (aka "CAW-Only Facilities"). This includes pipelines, pump stations, and terminal reservoir.

Table 7
Southern Transfer Pipeline Cost Estimate (2015 Dollars)

Item	Dec. 2015 Update (2015 Dollars)		Nov. 2013 Update (2012 Dollars)	
	6.4 MGD	9.6 MGD	6.4 MGD	9.6 MGD
Base Construction Costs				
Transfer Pipeline (Seaside to Term. Res.)	$ 9.7 M	$ 9.7 M	$ 7.1 M	$ 7.1 M
So. Trans. Pipeline (1st to Seaside Turnout)			$ 6.2 M	$ 6.2 M
Monterey Pipeline	$ 32.9 M	$ 32.9 M	$ 13.2 M	$ 13.2 M
Monterey Transfer Pump Station	$ 2.5 M	$ 2.5 M	$ 1.5 M	$ 1.5 M
Valley Greens Pump Station	$ 1.9 M	$ 1.9 M	$ 0.3 M	$ 0.3 M
Terminal Reservoir	$ 11.8 M	$ 11.8 M	$ 9.2 M	$ 9.2 M
ASR Wells 5 & 6	$ 8.0 M	$ 8.0 M	$ 6.6 M	$ 6.6 M
ASR Pipeline	$ 4.0 M	$ 4.0 M	$ 3.4 M	$ 3.4 M
Base Construction Subtotal	$ 70.8 M	$ 70.8 M	$ 53.4 M	$ 53.4 M
Implementation Costs	$ 16.8 M	$ 16.8 M	$ 14.5 M	$ 14.5 M
ROW/Land	$ 2.8 M	$ 2.8 M	$ 3.4 M	$ 3.4 M
Escalation Allowance	$ 2.5 M	$ 2.5 M	NA	NA
Contingency Allowance	$ 9.7 M	$ 9.7 M	$ 12.7 M	$ 12.7 M
Mitigation Cost Allowance	NA	NA	$ 1 M	$ 1 M
Total Capital Cost	$ 102.6 M	$ 102.6 M	$ 85.0 M	$ 85.0 M

Refer to summary table 3 for a comparison of overall 2012 Dollars to 2015 Dollars.

O&M COST ESTIMATING METHODOLOGY AND GENERAL NOTES

The annual O&M costs for the MPWSP consist primarily of the following components:

- Energy;
- Chemicals;
- Labor;
- Membrane and Media Replacement; and
- General Repair and Replacement (R&R)

O&M cost estimates for Membrane and Media Replacement and General Repair and Replacement are presented here as annual expenses; however, a portion or all of these costs may be treated as capital expenditures in financial analysis.

Generally, the methodology to estimate O&M Costs follows the methodology described in RBF's cost report dated January 9, 2013, using updated unit cost information. The following sections within explain any differences in the cost estimating method from that used in the previous work.

SUMMARY OF UPDATED O&M COST ESTIMATES

A summary of the O&M cost estimates for the 6.4 MGD and 9.6 MGD options is shown in Table 8 and discussed in the paragraphs that follow. Detailed worksheets are also attached.

Table 8
Summary of MPWSP Annual O&M Costs (2015 vs 2012 Dollars)

Item	Dec. 2015 Update (2015 Dollars)		Nov. 2013 Update (2012 Dollars)	
	6.4 MGD	9.6 MGD	6.4 MGD	9.6 MGD
Energy	$4,580,000	$6,090,000	$4,950,000	$6,600,000
Chemicals	$920,000	$1,200,000	$630,000	$770,000
Labor & Miscellaneous*	$3,360,000	$3,680,000	$2,730,000	$3,090,000
Membrane and Media Replacement	$90,000	$120,000	$410,000	$550,000
General Repair and Replacement	$1,570,000	$1,950,000	$1,580,000	$1,960,000
Purchased GWR Water ($2500/AF)	$8,750,000	NA	$8,750,000	NA
Total O&M Annual Cost	**$19,270,000**	**$13,040,000**	**$19,050,000**	**$12,970,000**

* Added cost for Ocean and Basin Monitoring

Energy Costs

Energy costs were developed for the following components:

- Pumping (intake well pump and motors, Monterey pump station, Valley Greens Pump Station, ASR wells and Seaside wells extraction);
- Treatment process (Desal Plant and Begonia Iron Removal Plant);
- Miscellaneous facility power usage

Pump headloss and flow rates were updated based on new design parameters which resulted in changes in energy consumption.

The electrical rates from 2012 were increased based on a PG&E average tarrif rate increase from December 2012 to December 2015 by 13% for summer and 9% for winter.

Chemical Costs

Several chemicals are required during the pretreatment, desalination, and post- treatment processes. The chemicals that are assumed to be required during the treatment process consist of:

- Sodium Hypochlorite (Iron oxidant, Disinfection)
- Sodium Bisulfite (Dechlorination)
- Carbon Dioxide (Alkalinity addition)
- Lime (calcite) (Remineralization)
- Sodium Hydroxide (pH adjustment)
- Various chemicals used in the Clean-in-Place (CIP) process for the RO membranes

Chemical costs were updated based on the CAW and CDM Smith actual $/lb chemical costs. Additionally updates in chemical costs related to the desalination plant were provided in CDM Smith's 2013 report

on estimated O&M costs.

Labor Costs & Miscellaneous

The labor rates that were used in the 2012 analysis were determined to still be accurate for 2015 Dollars. Additional costs were added for Ocean and Basin Monitoring.

Media/Membrane Replacement Costs

Media and membrane replacement costs associated with reverse osmosis membranes are included in the annual O&M cost. It assumes the following:

- Media replacement of 0.5 inches loss per vessel per year
- CIP cartridge filter replacement for each train and stage, 2 per year

General Repair and Replacement

An general Repair and Replacement (R&R) cost is included in the annual O&M costs for both projects. The R&R cost is a budgeted amount based on a long term average of expenditures for the repair and/or replacement of mechanical equipment (pumps, etc.), electrical equipment, instrumentation and controls, and basic facility maintenance. As mentioned previously, some portion of these costs may be treated as capital expenses. Industry standard assumptions for this type of cost range from one percent to three percent per year as a percentage of construction cost, with the higher percentages occurring as the facilities approach the end of their useful life.

Purchased GWR Water

For now an initial value of $2500 / AF is being used. This value may change based on new information to be filed in January 2016.